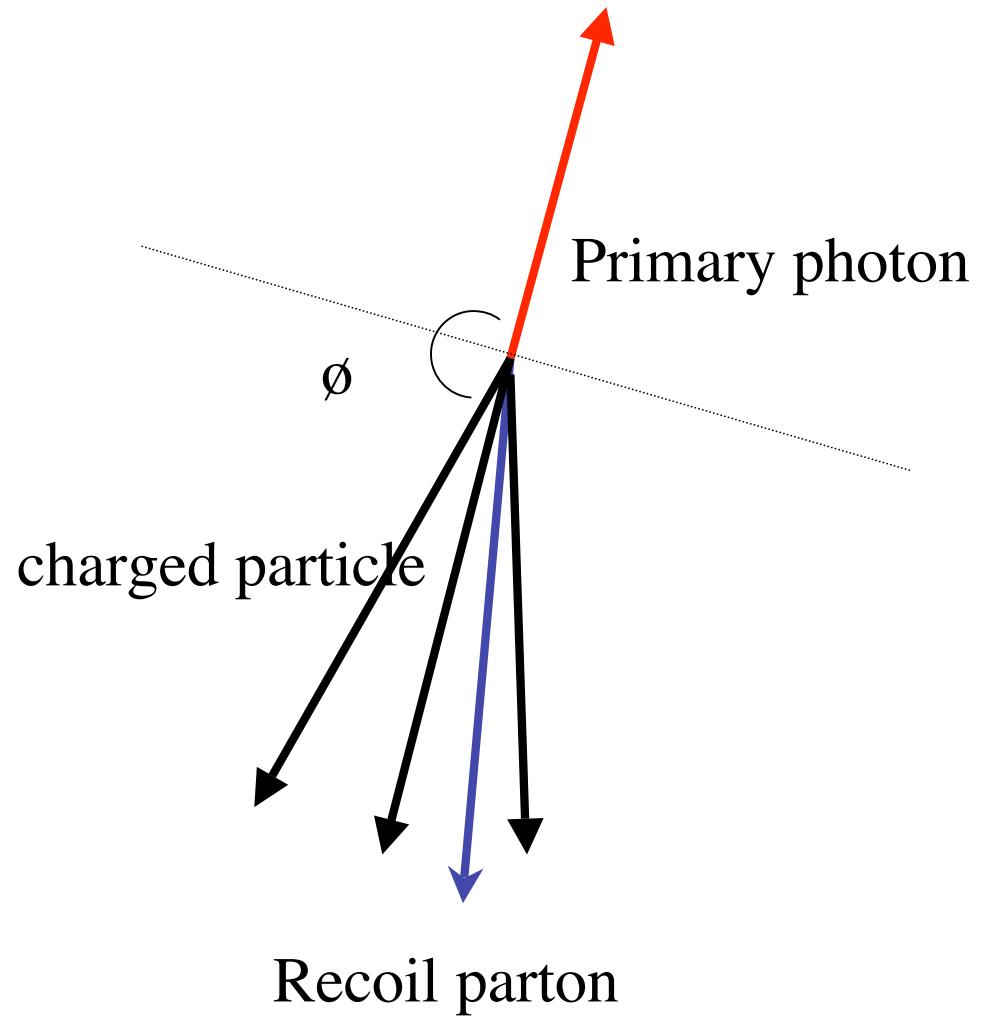
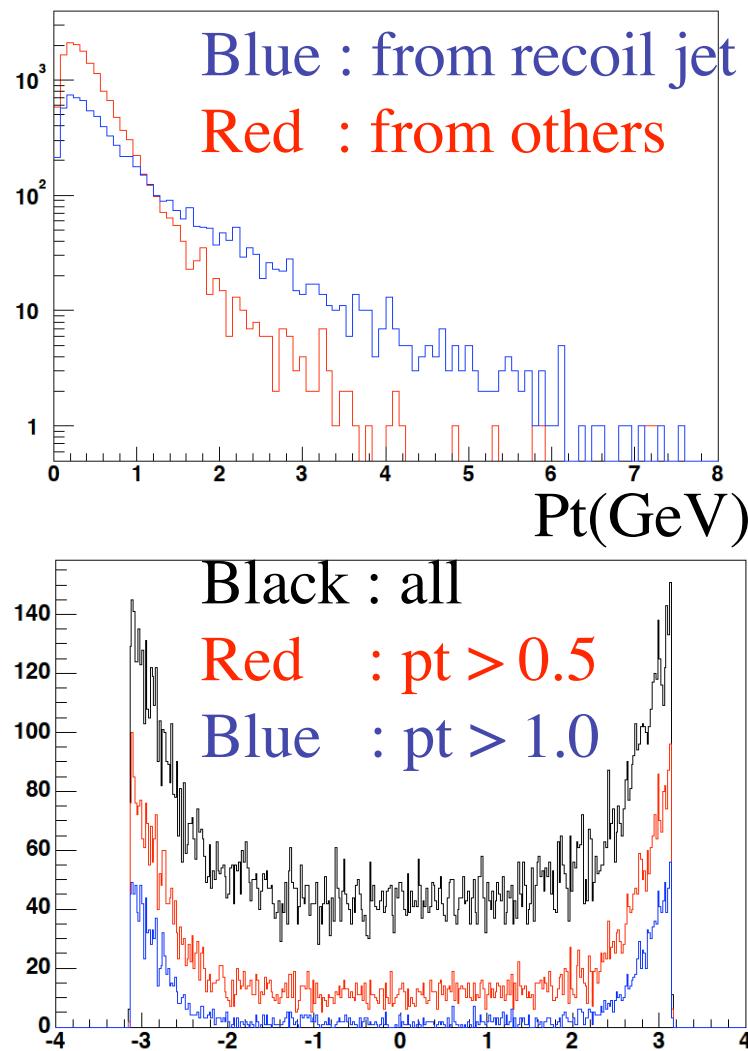


Gamma jet simulation (3)

silicon meeting 2003/09/24 M.Togawa



Jet algorithm

- Cone algorithm (depend on direction of particles)
 - Collect particles exceed a certain threshold (seed)
 - (Re)build a cone around the seed $\square * \square$ space (R)
 - And iterate..
- k_T algorithm (depend on p_T of particles)
 - Collect sets of clusters (pre-clustering from detector)
 - Minimize d_{ij} which is combination the 4-vectors of these clusters and connect in the certain cone space.
 - And iterate..
$$d_{ij} = \min(p_{i,T}^2, p_{j,T}^2) \frac{\square R_{ij}^2}{D^2}$$
D is parameter
 - > this algorithm may separate overlap jets.

We look just 1 jet and do not have good p_T resolution
-> Cone algorithm is enough now.

Set parameters to Cone algorithm

- Apply pt cut and

first cut : $\text{pt} = 1.0, 0.8, 0.6(\text{GeV})$

Remaining particles (1~3 particles remain)

$$\square^{jet} = \frac{\bigcup_i \square^i p_T^i}{\bigcup_i p_T^i}$$

$$\square^{jet} = \frac{\bigcup_i \square^i p_T^i}{\bigcup_i p_T^i}$$

-> first jet axis

- 2nd cut

2nd cut : $\text{pt} = 1.0, 0.8, 0.6(\text{GeV})$: combination with 1st cut

$R = 0.5$ (Cone radius)

Calculate cone radius R defined as

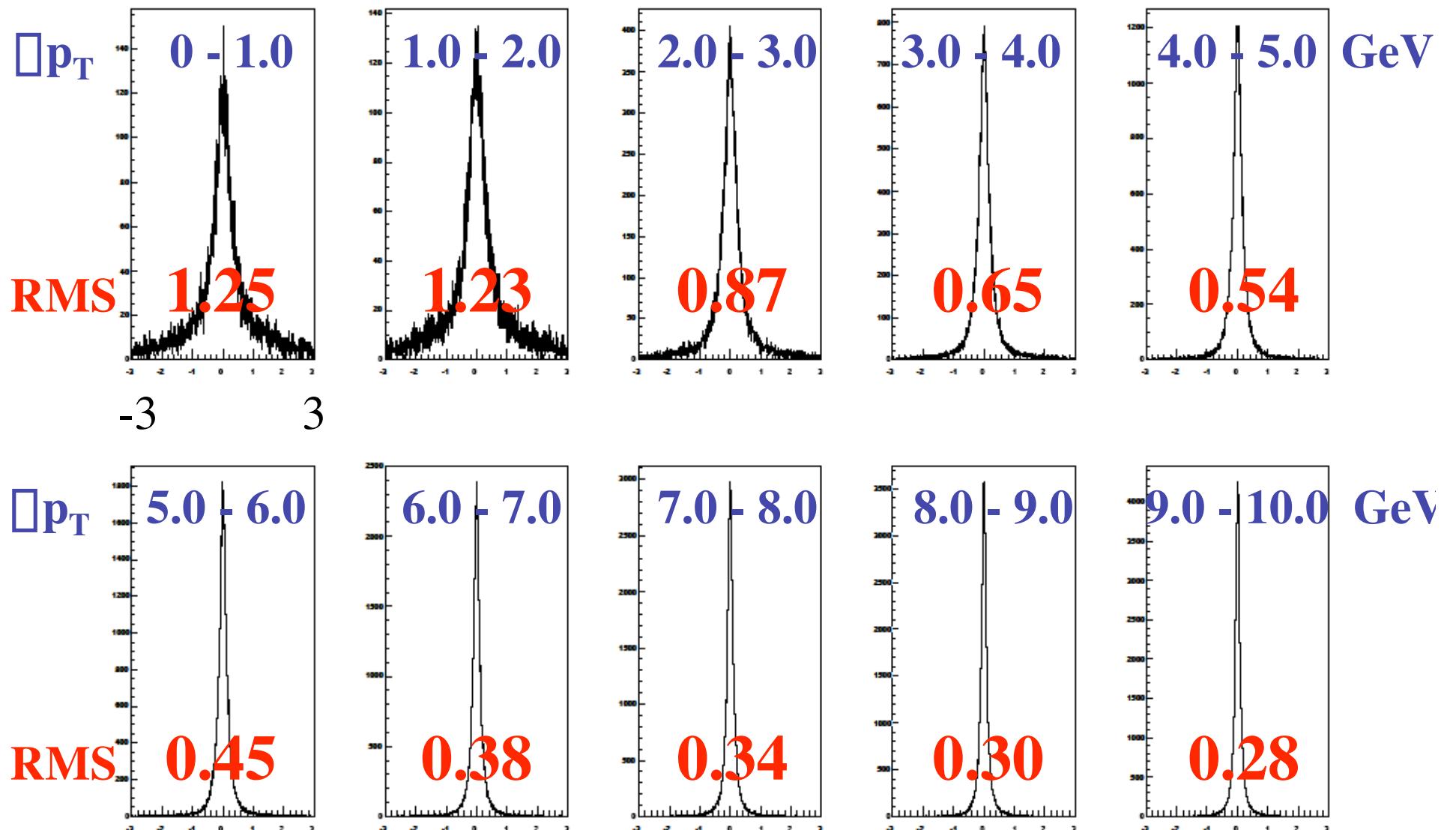
$$R_i = \sqrt{(\square_{jet} \square \square_i)^2 + (\square_{jet} \square \square_i)^2}$$

apply 2nd cut with R and pt and calculate jet axis

-> go to “2nd cut” ... iterate until same axis

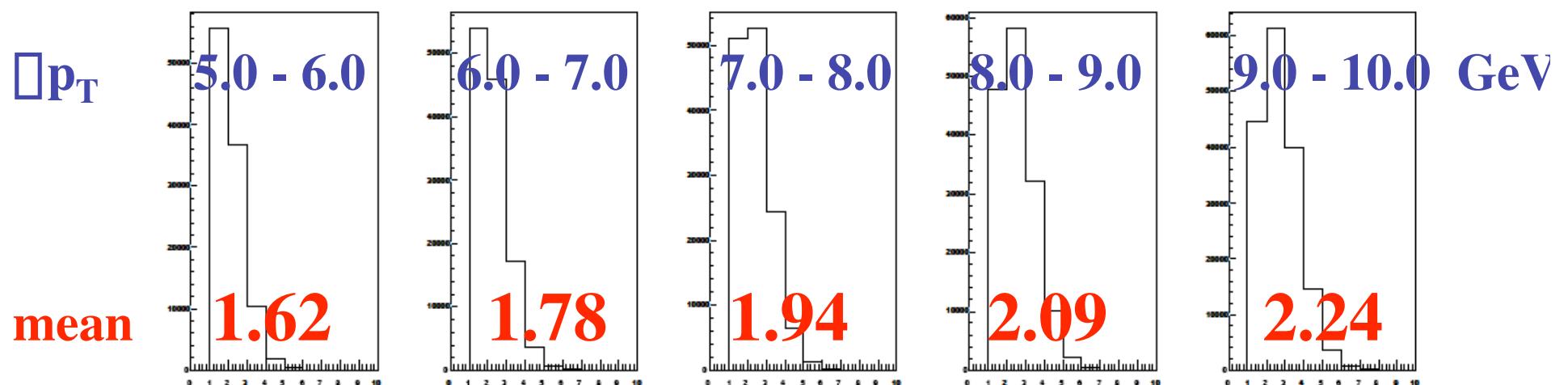
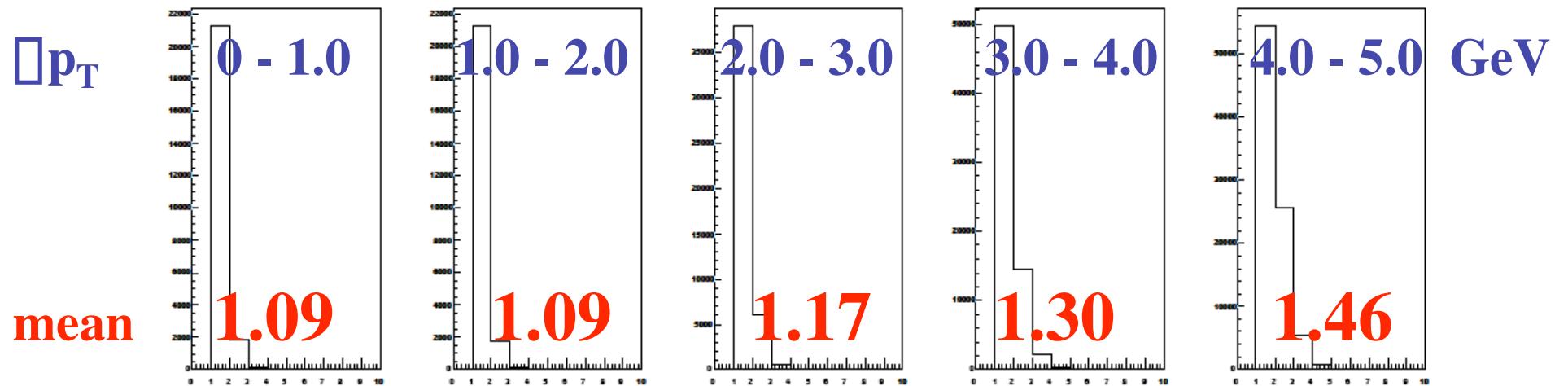
EndCap Δ eta

1st pt cut 1.0(GeV), 2nd pt cut 1.0(GeV), Cone R~0.5



EndCap N of charged Particles

1st pt cut 1.0(GeV), 2nd pt cut 1.0(GeV), Cone R~0.5



EndCap

Delta eta = $\eta_q - \eta_{jet}$ (RMS)

Efficiency = (N of reconstruct jet)/(All Event)

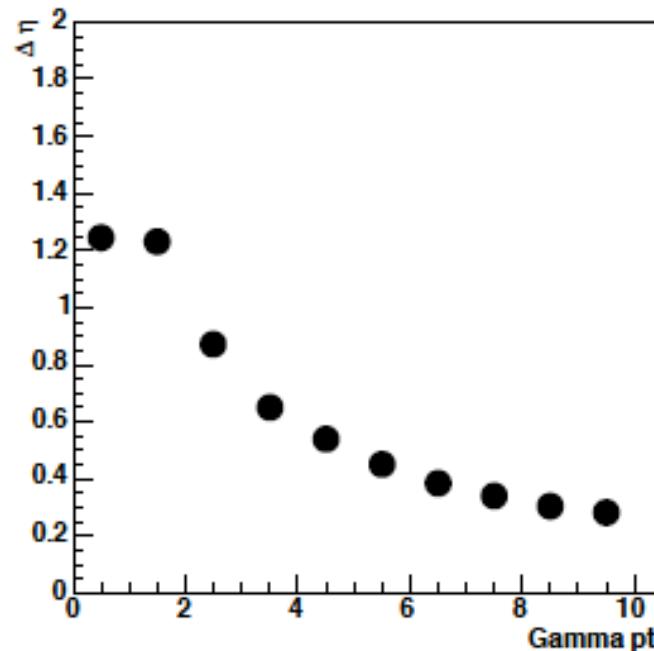
Purity = (N of qg \rightarrow qgamma)/(N of reconstruct jet)

** All Event means “Event of direct photon event detected by EMCal”

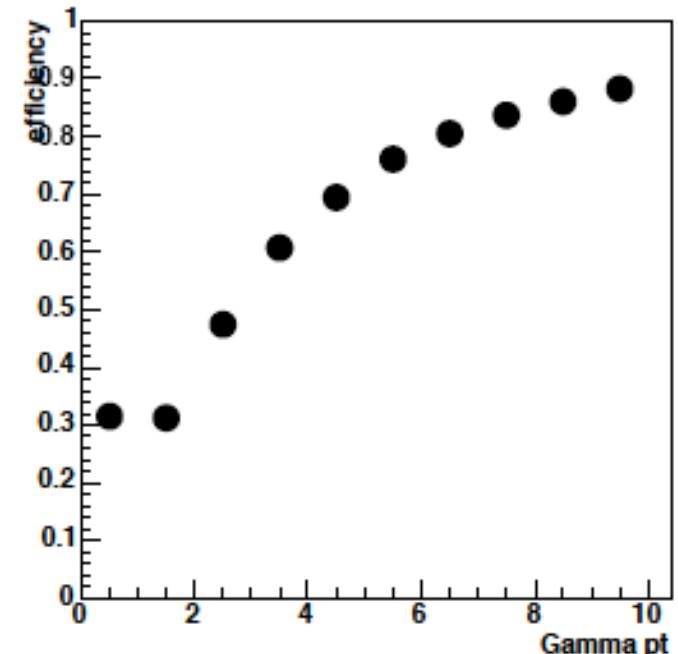
1st pt cut 1.0(GeV), 2nd pt cut 1.0(GeV), Cone R~0.5

| Pt (101005) | delta eta | efficiency | purity |
|-------------|-----------|------------|--------|
| 0_1 | 1.25 | 0.32 | 0.91 |
| 1_2 | 1.23 | 0.31 | 0.91 |
| 2_3 | 0.87 | 0.47 | 0.9 |
| 3_4 | 0.65 | 0.61 | 0.89 |
| 4_5 | 0.54 | 0.69 | 0.87 |
| 5_6 | 0.45 | 0.76 | 0.86 |
| 6_7 | 0.38 | 0.81 | 0.85 |
| 7_8 | 0.34 | 0.84 | 0.83 |
| 8_9 | 0.3 | 0.86 | 0.83 |
| 9_10 | 0.28 | 0.88 | 0.82 |

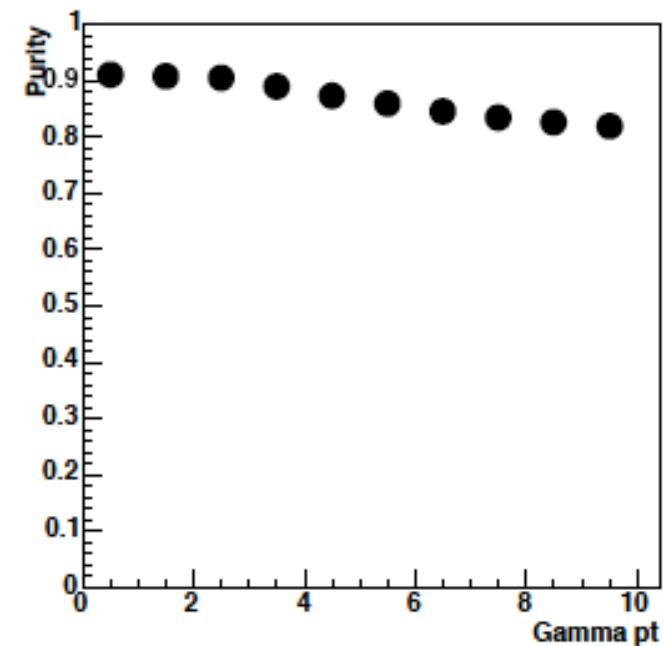
$\Delta\eta$ vs. Gamma pt



Jet Tag efficiency 2 vs. Gamma pt



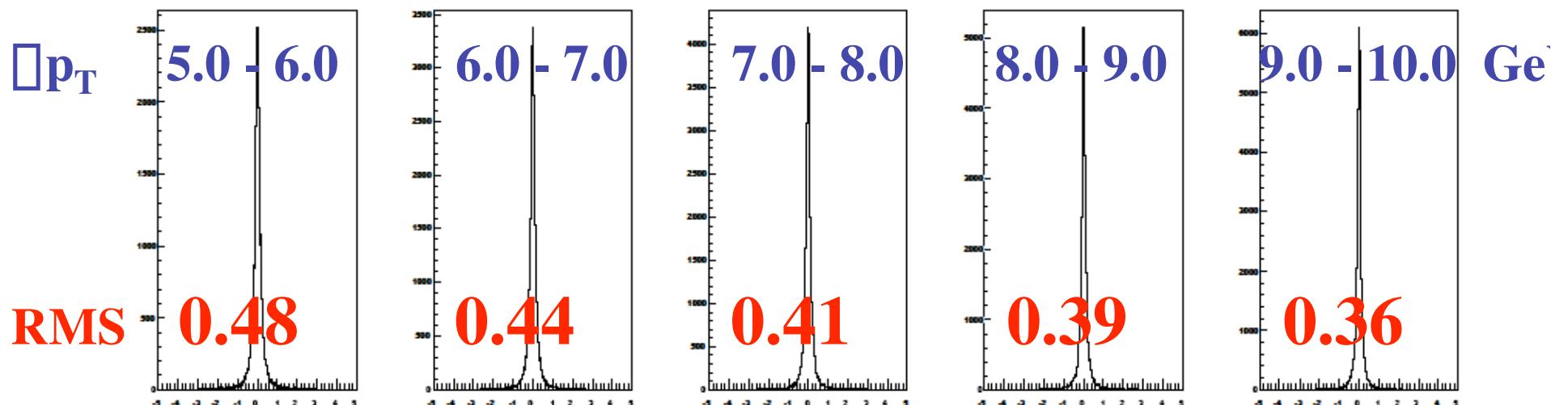
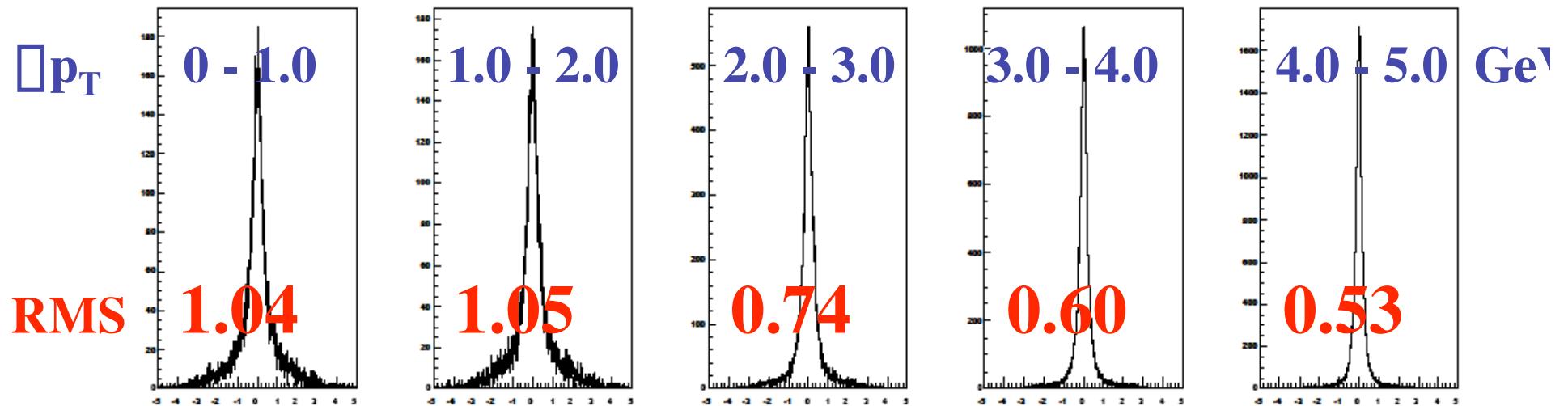
Purity(from generat tag) vs. Gamma pt



EndCap Summary

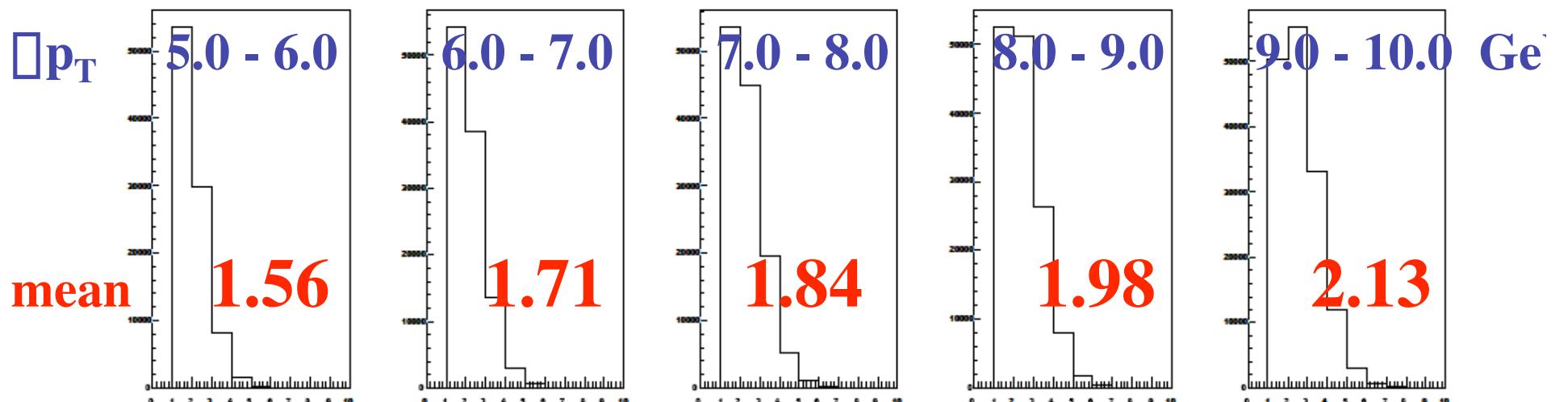
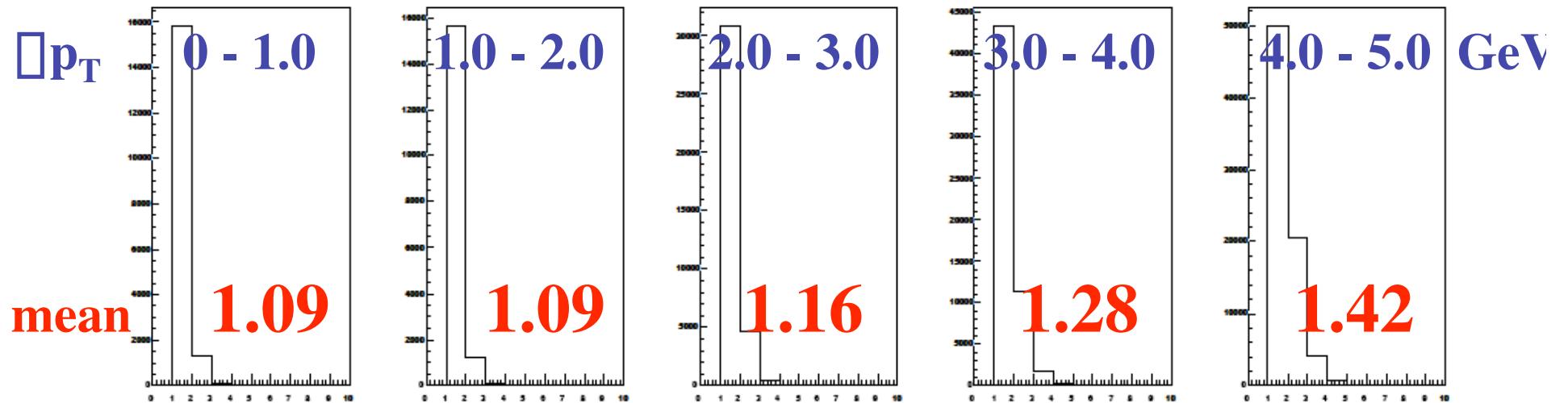
Barrel $\Delta\eta$

1st pt cut 1.0(GeV), 2nd pt cut 1.0(GeV), Cone R~0.5



Barrel N of charged Particles

1st pt cut 1.0(GeV), 2nd pt cut 1.0(GeV), Cone R~0.5



Barrel

Delta eta = $\eta_q - \eta_{jet}$ (RMS)

Efficiency = (N of reconstruct jet)/(All Event)

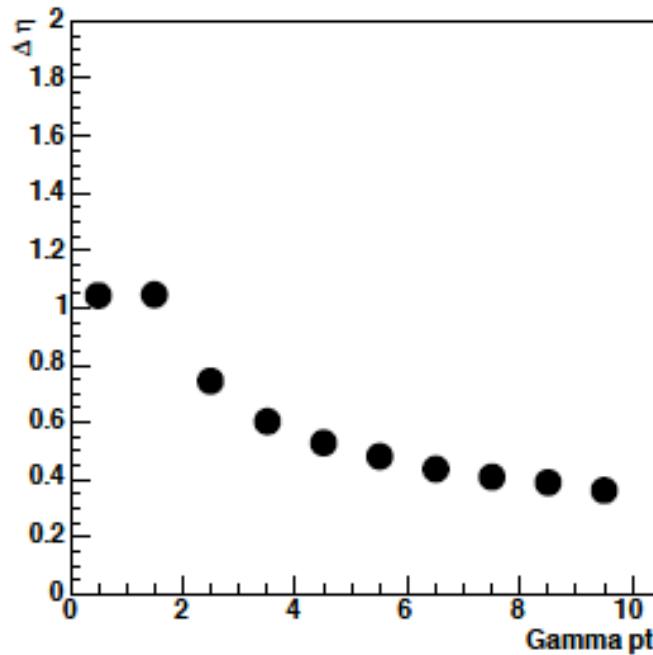
Purity = (N of qg \rightarrow qgamma)/(N of reconstruct jet)

** All Event means “Event of direct photon event detected by EMCAL”

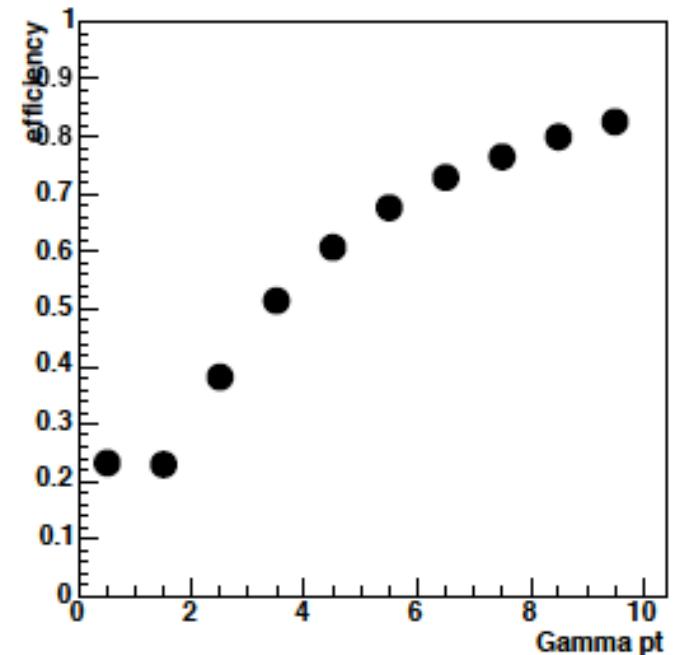
1st pt cut 1.0(GeV), 2nd pt cut 1.0(GeV), Cone R~0.5

| Pt (101005) | delta eta | efficiency | purity |
|-------------|-----------|------------|--------|
| 0_1 | 1.04 | 0.23 | 0.92 |
| 1_2 | 1.05 | 0.23 | 0.92 |
| 2_3 | 0.74 | 0.38 | 0.91 |
| 3_4 | 0.60 | 0.51 | 0.90 |
| 4_5 | 0.53 | 0.61 | 0.89 |
| 5_6 | 0.48 | 0.68 | 0.87 |
| 6_7 | 0.44 | 0.73 | 0.86 |
| 7_8 | 0.41 | 0.76 | 0.85 |
| 8_9 | 0.39 | 0.80 | 0.84 |
| 9_10 | 0.36 | 0.83 | 0.83 |

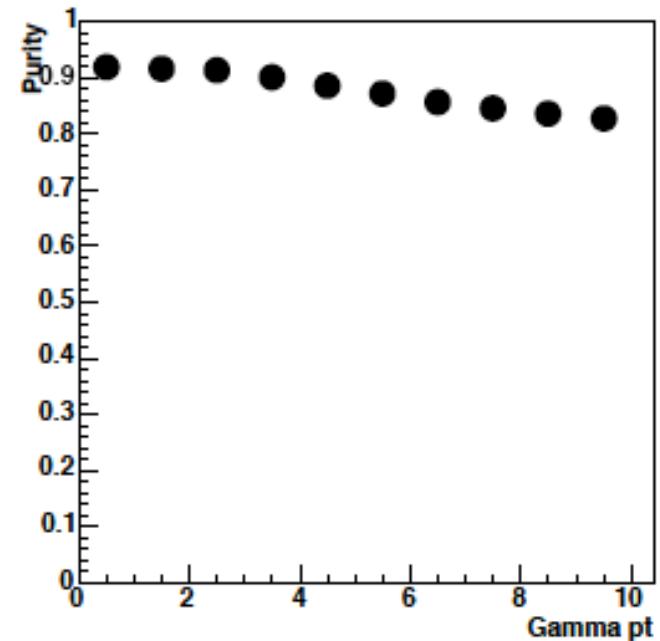
$\Delta \eta$ vs. Gamma pt



Jet Tag efficiency 2 vs. Gamma pt

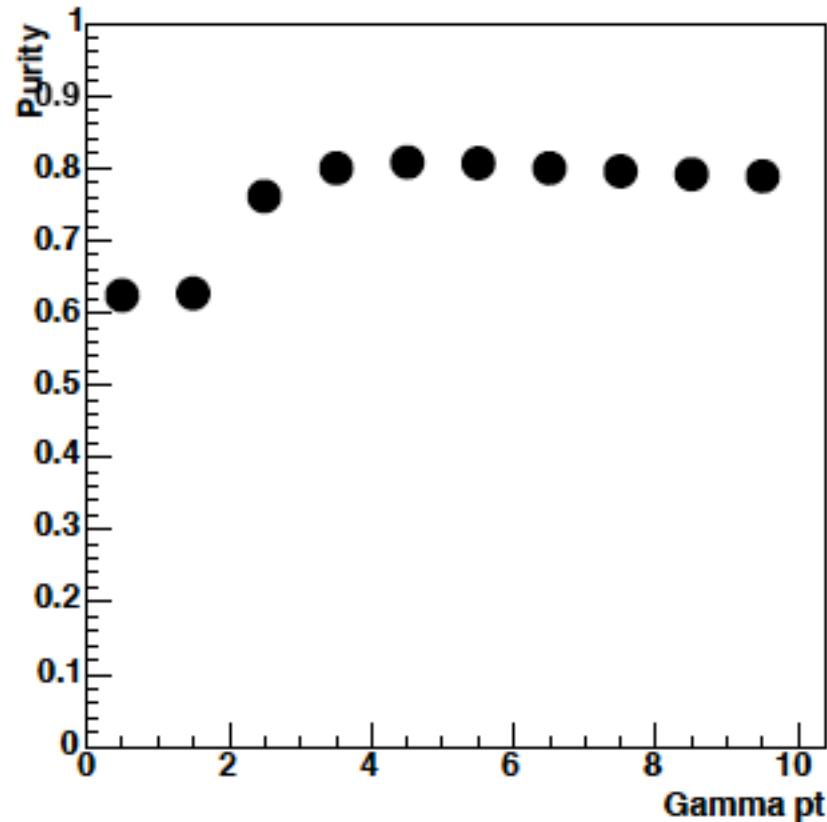


Purity(from generat tag) vs. Gamma pt

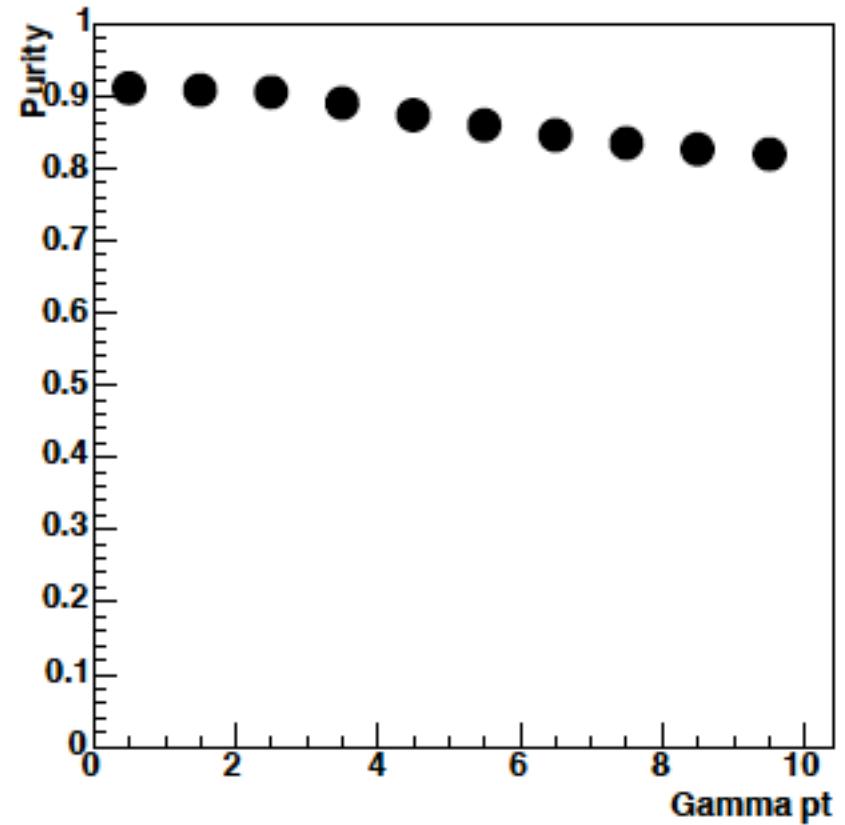


Barrel Summary

BU
EndCap



Purity(from generat tag) vs. Gamma pt



Left picture = $(N \text{ of event included at least 1 particle q origin}) / (\text{All Event})$

BU
EndCap

1st pt cut 1.0(GeV), 2nd pt cut 0.8(GeV), Cone R~0.5

| Pt (100805) | delta eta | efficiency | purity |
|-------------|-----------|------------|--------|
| 0_1 | | 1.25 | 0.32 |
| 1_2 | | 1.23 | 0.31 |
| 2_3 | | 0.87 | 0.48 |
| 3_4 | | 0.65 | 0.61 |
| 4_5 | | 0.54 | 0.7 |
| 5_6 | | 0.45 | 0.77 |
| 6_7 | | 0.39 | 0.81 |
| 7_8 | | 0.34 | 0.85 |
| 8_9 | | 0.31 | 0.87 |
| 9_10 | | 0.28 | 0.89 |

1st pt cut 0.8(GeV), 2nd pt cut 0.8(GeV), Cone R~0.5

| Pt (080805) | delta eta | efficiency | purity |
|-------------|-----------|------------|--------|
| 0_1 | | 1.34 | 0.43 |
| 1_2 | | 1.32 | 0.43 |
| 2_3 | | 0.94 | 0.56 |
| 3_4 | | 0.71 | 0.65 |
| 4_5 | | 0.57 | 0.72 |
| 5_6 | | 0.47 | 0.77 |
| 6_7 | | 0.4 | 0.81 |
| 7_8 | | 0.34 | 0.84 |
| 8_9 | | 0.31 | 0.87 |
| 9_10 | | 0.28 | 0.89 |

BU
EndCap

1st pt cut 0.8(GeV), 2nd pt cut 0.6(GeV), Cone R~0.5

| Pt (080605) | delta eta | efficiency | purity |
|-------------|-----------|------------|--------|
| 0_1 | | 1.34 | 0.44 |
| 1_2 | | 1.32 | 0.43 |
| 2_3 | | 0.94 | 0.57 |
| 3_4 | | 0.72 | 0.67 |
| 4_5 | | 0.57 | 0.74 |
| 5_6 | | 0.47 | 0.8 |
| 6_7 | | 0.4 | 0.83 |
| 7_8 | | 0.35 | 0.86 |
| 8_9 | | 0.31 | 0.88 |
| 9_10 | | 0.29 | 0.9 |

1st pt cut 0.6(GeV), 2nd pt cut 0.6(GeV), Cone R~0.5

| Pt (060605) | delta eta | efficiency | purity |
|-------------|-----------|------------|--------|
| 0_1 | | 1.4 | 0.49 |
| 1_2 | | 1.39 | 0.49 |
| 2_3 | | 0.98 | 0.57 |
| 3_4 | | 0.72 | 0.65 |
| 4_5 | | 0.57 | 0.72 |
| 5_6 | | 0.47 | 0.77 |
| 6_7 | | 0.4 | 0.81 |
| 7_8 | | 0.35 | 0.84 |
| 8_9 | | 0.31 | 0.87 |
| 9_10 | | 0.28 | 0.89 |